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Rainer Obwegger

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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/560,812
Filing Date: December 15, 2005
Appellant(s): OBWEGER ET AL.

Robert E. Goozner (Reg. No. 42,593)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 12, 2010, appealing from the Office action mailed January 8, 2010.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

1, 2, 4-17, 22-25 and 27-31.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

| | | |
|--------------|-----------------|---------|
| 6,632,292 | AERGERTER ET AL | 10-2003 |
| 2002/0050244 | ENGESSER | 5-2002 |
| 2002/0162570 | CAVAZZA | 11-2002 |
| 6,890,390 | AZAR | 5-2005 |
| 4,401,131 | LAWSON | 8-1983 |
| 5,788,453 | DONDE ET AL | 8-1998 |
| 6,532,977 | OTSUKI ET AL | 3-2003 |
| 2004/0132318 | KIM ET AL | 7-2004 |
| 5,762,708 | MOTODA ET AL | 6-1998 |

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which appellants regard as the invention.

Claim 6 recites "wherein said second plate of itself is not rotatable." It is unclear what is intended by this phrasing, rendering this claim indefinite. Furthermore, claim 1 recites "rotating means for rotating ... said second plate." Therefore, this claim negates independent claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4-11, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza.

As to claims 1, 2, 4 and 5, Aegerter discloses an apparatus for wet-treating a wafer comprising a first plate (Ref. #138) and a second plate (Ref. #144) substantially parallel to the first plate and horizontally arranged (Col. 10, lined 41-42; Figure 4). A first dispensing means for introducing a fluid into a first gap between said first plate and a wafer when being treated is provided in the form of a fluid supply tube (Ref. # 156) with a fluid outlet nozzle (Ref. # 158) (Col. 10, lines 56-60; Figure 4). The fluid supply tube extends centrally through the axis of rotation (Col. 10, lines 60-61). This structure is in accordance with the dispenser as described by appellants' specification. A second dispensing means is similarly provided to introduce fluid into a second gap between said second plate and a wafer being treated comprising a fluid supply tube (Ref. #160) and inlet (Ref. #148) (Col. 10, lines 62-64; Figure 10). Aegerter discloses rotating means in the form of a rotor (Ref. #115) and rotor motor assembly (Ref. #124), in accordance with appellants' specification, for rotating the work piece housing, which includes the wafer and second plate, relative to each other about an axis substantially perpendicular to the second plate (Col. 9, lines 62--Col. 10, line 14; Figure 4).

Aegerter discloses wafer support members (Ref. #240) for clamping the wafers (Col. 12, lines 44-55) in the form of fasteners (Ref. #307) for holding a wafer between said first and seconds plates, substantially parallel to said plates (Col. 9, lines 52-60; Figure 1), but does not expressly disclose holding means in the form of grippers.

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Aegerter also does not expressly disclose that the holding means and first plate are coupled to each other to form a holding unit. Aegerter does not expressly disclose at least one vibrating element acoustically coupled to at least said second plate.

Engesser discloses holding means in the form of gripping pins which are movable through a mechanism (Page 3, Paragraph [0039]). The gripping pins are mounted to a mask, which corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such that a gap remains, so it is understood to be appellants' claimed plate (Page 1, Paragraph [0013], [0015]). The gripping pins mounted to the plate comprise a holding unit as claimed.

Cavazza discloses a transducer that generates ultrasonic vibrations to clean a substrate facing downward (Page 1, Paragraphs [0011]-[0015]; Page 3, Paragraph [0032]). A working surface directed upward and placed under the substrate, which is appellants' claimed second plate, is mechanically connected to the ultrasound transducer (Page 1, Paragraphs [0011]-[0015]), and therefore is acoustically coupled.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include gripping pins and to couple the holding means and first plate to form a holding unit as taught by Engesser in order to hold the wafer. One of ordinary skill would have been motivated to use gripping pins to insure that the wafer is securely held in place during cleaning.

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter and Engesser to include a vibrating element acoustically coupled to the second plate as taught by Cavazza in

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order to improve cleaning of the wafer. Cavazza teaches that due to the ultrasonic vibration, no particle can remain sufficiently strongly attached to the face to be treated so as to resist the liquid and gravity (Page 1, paragraph [0008]).

As to claim 6, Aegerter does not expressly disclose that the second plate is not rotatable. Engesser discloses a device for wet cleaning a wafer where the mask (i.e. plate) is held stationary (Page 2, Paragraph [0020]). The mask corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such that a gap remains, so it is understood to be appellants' claimed plate (Page 1, Paragraph [0013], [0015]). While Engesser only discloses one plate, it is apparent that either the first or second plate as taught by Kim could be held stationary.

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter to include a second plate that is not rotatable as taught by Engesser. One of ordinary skill would have been motivated to make this modification which is advantageous when the liquid between the plate and wafer should experience as little motion in itself as possible, thereby preventing it from reaching an area which is not to be treated by it (Page 2, Paragraph [0020]).

As to claims 7 and 8, Aegerter further discloses that a cup (liquid collector) may be disposed about the apparatus, including said holding means, for collecting used processing liquids (Col. 11, lines 22-25). It is understood that if the liquid collector is disposed about the apparatus, the plates are sealed to the liquid collector such that liquid flows into the collector without being lost.

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As to claim 9, Aegerter does not expressly disclose means for varying distance as defined by appellants' specification to be hydraulic, pneumatic, or electromechanical elements, such as a belt drive or a ball spindle. Engesser discloses distance changing means in the form of a pneumatic cylinder or a spindle (Page 3, Paragraph [0041]). It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter to include means for varying distance as taught by Engesser (Page 3, Paragraph [0041]). One of ordinary skill would have been motivated to add means for varying distance so that the gap between the plate and the wafer can be varied to insert and remove a wafer.

As to claims 10 and 11, Aegerter teaches that a space gap is maintained between the wafer and the first and second plates while treating the wafer (Col. 10, lines 47-52), but does not expressly teach that this gap is 0.1 mm to 10 mm or 0.5 mm to 5 mm. Engesser discloses a gap of about 0.05 to 1 mm between a wafer and a mask (i.e. plate) (Page 2, Paragraph [0018]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include a gap of 0.05 - 1 mm between the wafer and each plate as taught by Engesser since Engesser teaches that this gap size prevents thin liquids from running out of the capillary area between the plate and the wafer (Page 2, Paragraph [0018]).

As to claim 13, Aegerter further discloses an additional gas dispenser for the first gap (Col. 23, lines 31-34).

As to claim 14, Aegerter further discloses outlets, which are openings, in each of the plates that are spaced from each respective inlet. Since each inlet is located in the

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center of the plate, which is the rotational center, the spacing means that the outlets do not include the rotational center (Page 1 O, lines 65-66).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of USPN 6, 890,390 to Azar.

Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

As to claim 12, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose that the vibrating element is arranged with respect to the second plate facing the wafer such that the ultrasonic waves are substantially directed to the wafer when treated taking an angle of 85-60 degrees to the plane provided for the wafer. Azar discloses an ultrasonic cleaning system where the transducers are oriented at a steering angle, Θ_s which can be modified. The example steering angle provided is thirty degrees, meaning that the ultrasonic waves are directed to the wafer at an angle of sixty degrees (Col. 5, lines 40-45; Figure 6). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Aegerter, Engesser, and Cavazza to include transducers oriented such that the ultrasonic waves are directed towards the second plate at 60-85 degrees as taught by Azar for the benefit of producing maximum acoustic intensity to improve cleaning. Furthermore, since the general conditions the claims are disclosed in the prior art, these

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optimum or workable ranges could be determined by routine experimentation. (MPEP 2144.05 A).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of USPN 4,401,131 to Lawson et al.

Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

As to claim 15, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose that at least one vibrating element is arranged to cover the area of the rotational axis. Lawson discloses a transducer faceplate which is large enough to fully overlie a wafer to be cleaned, including piezoelectric transducer elements for vibration (Col. 2, lines 34-37, 58-60). If the vibrating elements cover the entirety of the wafer, they must cover the area of the rotational axis. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Aegerter, Engesser, and Cavazza, to include a vibrating element arranged to cover the area of the rotational axis for the benefit of producing a uniform acoustic field across the wafer (Col. 1, lines 44-45).

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and

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**US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of
USPN 5,788,453 to Donde et al.**

Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

As to claim 16, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose means for opening and closing holding elements of said holding elements of said holding means during treatment of the wafer. According to appellants' specification, means for opening and closing holding elements are defined as a tooth gear which drives eccentrically movable pins is agitated through a servomotor or each pin is driven through a magnetic or piezoelectric switch. Donde discloses a system of piezoelectric grippers for holding a wafer, and which open and close to grasp a wafer, in accordance with appellants' specification (Col. 3, lines 7-9, 33-37). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, and Cavazza to include piezoelectric grippers as taught by Donde to open and close the holding elements during treatment of a wafer. One of ordinary skill would have been motivated to add piezoelectric grippers for the benefit of reducing contamination because they can serve to grip the wafer without relative frictional motion between the gripper and the wafer, which can adversely generate contaminating particles (Col. 16, lines 1-7).

**Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over
USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and**

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**US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of
USPN 6,532,977 to Otsuki et al.**

Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

As to claim 17, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose that at least one plate at least partly comprises material having a specific sound propagation velocity greater than that of water. Otsuki discloses a cleaning vessel body made of a layer of silicon carbide, which propagates ultrasonic waves in a liquid solution (Col. 2, lines 32-42). The acoustic velocity of the ultrasonic waves propagated through the silicon carbide is 4000 to 20000 m/s. According to appellants, the sound propagation velocity of water is 1500 m/s. Therefore, this material has a sound propagation velocity greater than that of water, and is suited for cleaning equipment. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, and Cavazza to include a plate comprising a material having a sound propagation velocity more than that of water as taught by Otsuki so that sound propagation of ultrasonic waves can be increased. It is desired to increase sound propagation velocity to enhance cleaning.

**Claims 22-24 and 27-30 are rejected under 35 U.S.C. 103(a) as being
unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA
2002/0050244 to Engesser, USPA 2002/0162570 to Cavazza, USPA 20040132318 to
Kim et al. and 6,890,390 to Azar.**

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As to claims 22-24 and 27, Aegerter discloses an apparatus for wet-treating a wafer comprising a first plate (Ref. #138) (Col. 10, lined 41-42; Figure 4) and a first dispensing means for introducing a fluid into a first gap between said first plate and a wafer when being treated is provided in the form of a fluid supply tube (Ref. # 156) with a fluid outlet nozzle (Ref. # 158) (Col. 10, lines 56-60; Figure 4). The fluid supply tube extends centrally through the axis of rotation (Col. 10, lines 60-61). This structure is in accordance with the dispenser as described by appellants' specification. Aegerter discloses rotating means in the form of a rotor (Ref. # 115) and rotor motor assembly (Ref. #124), in accordance with appellants' specification, are provided for rotating the work piece housing, which includes the wafer and first plate, relatively about an axis substantially perpendicular to the first plate (Col. 9, lines 62--Col. 10, line 14; Figure 4). According to the specification, holding means are defined as gripping means, which are further defined as comprising movable gripping pins. Aegerter discloses wafer support members (Ref. #240) for clamping the wafers (Col. 12, lines 44-55) in the form of fasteners (Ref. #307) for holding a wafer between said first and seconds plates, substantially parallel to said plates (Col. 9, lines 52-60; Figure 1).

Aegerter does not expressly disclose gripping pins in accordance with the specification. Aegerter does not expressly disclose at least one vibrating element acoustically coupled to at least said first plate or adjustment elements in order to direct ultrasonic waves at an angle α of less than 89° to a wafer when treated, where the adjustment-elements comprise an array of a plurality of transducers with at least one ultrasonic generator to separately agitate said plurality of transducers in a phase-shifted

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way in order to generate an ultrasonic wave directed from said array of transducers at an angle of less than 89 degrees, that said array of transducers is a two dimensionally arranged plurality of transducers or that the transducer is placed in a slanted plane and is acoustically coupled to an intermediate liquid chamber, which is further acoustically coupled to the first plate. Engesser discloses gripping means in the form of gripping pins which are movable through a mechanism (Page 3, Paragraph [0039]). The gripping pins are mounted to a mask, which corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such that a gap remains, so it is understood to be appellants' claimed plate (Page 1, Paragraph [0013], [0015]).

Cavazza discloses a transducer that generates ultrasonic vibrations to clean a substrate facing downward (Page 1, Paragraphs [0011]-[0015]; Page 3, Paragraph [0032]). A working surface directed upward and placed under the substrate, i.e. a plate, is mechanically connected to the ultrasound transducer (Page 1, Paragraphs [0011]-[0015]), and therefore is acoustically coupled. The transducer is further coupled to a tank for holding liquid, which is appellants' intermediate liquid chamber (Page 2, Paragraph [0032]). As the vibrations are applied to the substrate and plate through the transducer's waves generated in the chamber, the liquid chamber is acoustically coupled to the first plate.

Kim discloses adjustment-elements in the form of a positioning system (Ref. #620) that can raise, lower, or tilt the acoustic transducer (Ref. #612) (Page 4, Paragraph [0043]). It is shown that this tilting can result in the direction of ultrasonic waves at an angled of less than 89° to a wafer when treated (Figures 6, 14). The

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transducer (Ref. #612) is thus placed in a slanted plane (Figures 6, 14) by the adjustment element (Page 5, Paragraph [0044]). Kim teaches that the acoustic transducer can be positioned to direct acoustic energy to either surface of the wafer (Page 5, Paragraph [0044]).

Azar discloses a cleaning system with a plurality of transducer elements arranged in an array which may be a matrix array (two dimensional), with a plurality of drivers (ultrasonic generator) such that each driver is connected to a transducer (Col. 3, lines 18-24; Col 7, lines 32-33). Each driver generates an electric signal such that each transducer element separately vibrates in response to generate an ultrasonic wave (Col. 3, lines 25-30). Phase steering can be accomplished by controlling the phase of each transducer (Col. 5, lines 27-29). Azar teaches an example where an ultrasonic wave is directed at an angle of 30° , which is less than 89° (Col. 5, lines 41-42).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include gripping pins and to couple the holding means and first plate to form a holding unit as taught by Engesser in order to hold the wafer. One of ordinary skill would have been motivated to use gripping pins to insure that the wafer is securely held in place during cleaning.

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter and Engesser to include a vibrating element acoustically coupled to the second plate as taught by Cavazza in order to improve cleaning of the wafer. Cavazza teaches that due to the ultrasonic

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vibration, no particle can remain sufficiently strongly attached to the face to be treated so as to resist the liquid and gravity (Page 1, paragraph [0008]).

It would have been obvious to one of ordinary skill in the art to further modify the apparatus taught by Aegerter, Engesser, and Cavazza to include an adjustment element in a slanted plane as taught by Kim so that the acoustic energy being applied to the back surface of the semiconductor wafer can be controlled (Page 4, Paragraph [0043]). One of ordinary skill would have further been motivated to add a liquid chamber so that there is a constant supply of cleaning liquid in which to produce cavitation.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, Cavazza and Kim to include a two dimensional array of transducers as taught by Azar in order to direct ultrasonic energy onto a localized area on a substrate surface (Col. 2, lines 37-39). One of ordinary skill would have been motivated to add a plurality of transducers to uniformly clean the surface of a substrate (Col. 3, lines 10-12).

As to claims 28-30, Aegerter does not expressly disclose that the quotient of the distance a of the first plate to the wafer surface facing said first plate and the mean distance d between the centers of two adjacent transducers of the array is greater than 5 ($a/d > 5$); that the mean distance between the centers of two adjacent transducers of the array is smaller than 2 mm; wherein the width D of the array of the transducers is at least three times as big as the distance d_1 of the first plate to the wafer surface facing said plate. Azar discloses the parameters of the array including the center-to-center spacing between transducer elements, the width of each element, the total aperture

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dimension, and the elevation dimension (Col. 5, lines 1-4). Azar teaches that the parameters of the array can be controlled to produce steering and focusing (Col. 3, lines 53-60; Col. 7, lines 26-28). It would have been obvious to one of ordinary skill at the art at the time of the invention to further modify the device taught by Aegerter, Engesser, Cavazza and Kim to include the adjustable parameters as taught by Azar. Since the general conditions the claims are disclosed in the prior art, these optimum or workable ranges could be determined by routine experimentation in order to optimize ultrasonic cleaning (MPEP 2144.05 A).

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser, USPA 2002/0162570 to Cavazza, USPA 20040132318 to Kim et al. and 6,890,390 to Azar as applied to claim 24 above, and further in view of USPN 5,762,708 to Motoda et al.

Aegerter, Engesser, Cavazza, Kim and Azar are relied upon as discussed above with respect to the rejection of Claim 25.

As to claim 25, Cavazza further discloses that the intermediate liquid chamber includes an annular duct (channel #9) (Page 2, Paragraphs [0027], [0032]; Figure 3), but the combination of Aegerter, Engesser, Cavazza, Kim and Azar does not expressly disclose that the intermediate liquid chamber includes an annular gas suction nozzle. Motoda discloses a substrate treatment apparatus comprising an annular drain cup comprising an air (gas) suction path (i.e. nozzle) (Col. 4, lines 17-34; Figure 1). It would

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have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, Cavazza, Kim and Azar to include an annular gas suction path as taught by Motoda for the benefit of assisting liquid collection in the annular duct.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser, USPA 2002/0162570 to Cavazza, and USPA 20040132318 to Kim et al.

As to claim 31, Aegerter discloses an apparatus for wet-treating a wafer comprising a first plate (Ref. #138) (Col. 10, lined 41-42; Figure 4) and a first dispensing means for introducing a fluid into a first gap between said first plate and a wafer when being treated is provided in the form of a fluid supply tube (Ref. # 156) with a fluid outlet nozzle (Ref. # 158) (Col. 10, lines 56-60; Figure 4). The fluid supply tube extends centrally through the axis of rotation (Col. 10, lines 60-61). This structure is in accordance with the dispenser as described by appellants' specification. Aegerter discloses rotating means in the form of a rotor (Ref. # 115) and rotor motor assembly (Ref. #124), in accordance with appellants' specification, are provided for rotating the work piece housing, which includes the wafer and first plate, relatively about an axis substantially perpendicular to a second plate (Col. 9, lines 62--Col. 10, line 14; Figure 4). The second plate (Ref. #144) is substantially parallel to the first plate (Col. 10, lined 41-42; Figure 4) with second dispensing means similarly provided to introduce fluid into a second gap between said second plate and a wafer being treated comprising a fluid

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supply tube (Ref. # 160) and inlet (Ref. #148) (Col. 10, lines 62-64; Figure 10).

According to the specification, holding means are defined as gripping means, which are further defined as comprising movable gripping pins. Aegerter discloses wafer support members (Ref. #240) for clamping the wafers (Col. 12, lines 44-55) in the form of fasteners (Ref. #307) for holding a wafer between said first and seconds plates, substantially parallel to said plates (Col. 9, lines 52-60; Figure 1).

Aegerter does not expressly disclose gripping pins in accordance with the specification. Aegerter does not expressly disclose at least one vibrating element acoustically coupled to at least said first plate or adjustment elements in order to direct ultrasonic waves at an angle α of less than 89° to a wafer when treated. Engesser discloses gripping means in the form of gripping pins which are movable through a mechanism (Page 3, Paragraph [0039]). The gripping pins are mounted to a mask, which corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such that a gap remains, so it is understood to be appellants' claimed plate (Page 1, Paragraph [0013], [0015]).

Cavazza discloses a transducer that generates ultrasonic vibrations to clean a substrate facing downward (Page 1, Paragraphs [0011]-[0015]; Page 3, Paragraph [0032]). A working surface directed upward and placed under the substrate, i.e. a plate, is mechanically connected to the ultrasound transducer (Page 1, Paragraphs [0011]-[0015]), and therefore is acoustically coupled. Kim discloses adjustment-elements in the form of a positioning system (Ref. #620) that can raise, lower, or tilt the acoustic transducer (Ref. #612) (Page 4, Paragraph [0043]). It is shown that this tilting can result

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in the direction of ultrasonic waves at an angled of less than 89° to a wafer when treated (Figures 6, 14). The transducer (Ref. #612) is thus placed in a slanted plane (Figures 6, 14) by the adjustment element (Page 5, Paragraph [0044]). Kim teaches that the acoustic transducer can be positioned to direct acoustic energy to either surface of the wafer (Page 5, Paragraph [0044]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include gripping pins and to couple the holding means and first plate to form a holding unit as taught by Engesser in order to hold the wafer. One of ordinary skill would have been motivated to use gripping pins to insure that the wafer is securely held in place during cleaning.

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter and Engesser to include a vibrating element acoustically coupled to the second plate as taught by Cavazza in order to improve cleaning of the wafer. Cavazza teaches that due to the ultrasonic vibration, no particle can remain sufficiently strongly attached to the face to be treated so as to resist the liquid and gravity (Page 1, paragraph

It would have been obvious to one of ordinary skill in the art to further modify the apparatus taught by Aegerter, Engesser, and Cavazza to include an adjustment element in a slanted plane as taught by Kim so that the acoustic energy being applied to the back surface of the semiconductor wafer can be controlled (Page 4, Paragraph [0043]).

(10) Response to Argument

Regarding the first ground of rejection (see the Appeal Brief at page 10, section 7.1), appellants argue that the phrase “wherein said second plate of itself is not rotatable” in claim 6, line 2 does not render the claim indefinite in view of the claim 1 phrase “rotating means for rotating ... said second plate” (claim 1, line 13) since, it is alleged, the rotating means is used to rotate the holding means and/or the second plate so that these they can rotate relatively (see the Appeal Brief at page 10, paragraph beginning “That is”). The examiner maintains the position that it is not clear what it means for an element to be rotatable and yet not be rotatable “of itself”. It does not clarify the issue by putting forth that the element is disclosed as being rotatable only relative to another element since the question remains: What does it mean for a first element to be rotatable relative to a second element and to not be rotatable “of itself”? Based on appellants' arguments in the Appeal Brief (page 10, last page to page 11, page 11, paragraph beginning “As should be clear”), it appears that the intended meaning is that the intended meaning is that the first element is rotatable relative to a second element but is not rotatable relative to a third element. However, assuming this is the correct meaning, this meaning is not clear based on the phrase “of itself is not rotatable” in claim 6. It is noted that the phrase “means for rotating” in the third to last sentence of page 10 of the Appeal Brief should apparently be “holding means”.

Regarding the second ground of rejection (see the Appeal Brief at page 11, section 7.2), appellants first argue that the applied art does not teach or suggest a

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rotating means for rotating a holding means and a second plate relative to each other since, it is alleged, Aegerter (US 6,632,292) discloses rotating a wafer with the second plate (see the Appeal Brief at page 13, last paragraph). The examiner maintains the position that the claim does not recite that the wafer and second plate rotate relatively against each other, as was recited in withdrawn claim 18. Claim 1 recites "relative to each other" (line 14). "Relative" is defined as having a relation, connection, or necessary dependence on another thing. Therefore, since the holding means and second plate are rotated together, they read on the claim limitation of rotating relative to each other because there is a necessary relationship between the two.

Appellants next argue that the term "relative to each other" should be interpreted as meaning the same thing as "relative against each other" since an applicant can be his or her own lexicographer (see the Appeal Brief at page 14, first paragraph). The examiner agrees that an applicant can be his or her own lexicographer, but maintains that this argument is not on point here since the term is not defined in appellants' specification. Thus the broadest reasonable interpretation was given.

The following issue is being addressed for the first time because it was first raised in the Appeal Brief. Appellants next argue that the applied art does not teach or suggest the claimed rotating means since, it is alleged, the rotating means of the applied art is different than the rotating means of the present invention (see the Appeal Brief at page 15, third paragraph), which disregards the structure disclosed in appellants' specification when "rotating means" is interpreted under 35 USC 112, sixth paragraph (see the Appeal Brief at page 14, paragraph beginning "Further, some

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claim"). The position of the examiner is that since the applied art discloses rotating means which: A) performs the function specified in the claim (i.e. rotating the holding means and second plate relative to each other about an axis substantially perpendicular to the second plate (Aegerter Col. 9, lines 62--Col. 10, line 14; Figure 4)); B) is not excluded by any explicit definitions provided in the specification for an equivalent; and C) is an equivalent of the rotating means, then the rotating means of the applied art is an equivalent in accordance with appellants' specification (see the Office action mailed 1/8/2010 at page 4, paragraph #9). MPEP 2183.

Appellants next argue that the applied art does not teach or suggest the claimed rotating means since, it is alleged, the present invention produces unexpected results (see the Appeal Brief at page 15, last paragraph). The position of the examiner is that the record is lacking objective factual evidence supporting the purported unexpected results over the device of the Aegerter teaching, and arguments of counsel cannot take the place of factually supported objective evidence. MPEP 2145.

Regarding the third ground of rejection (see the Appeal Brief at page 16, section 7.3), appellants apparently argue, without support, that the disclosure regarding the device of the Azar (US 6,890,390) teaching could not be bodily incorporated into device as per the teachings of the other applied references (see the Appeal Brief at page 16, last paragraph). The position of the examiner is that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly

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suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Regarding the fourth ground of rejection (see the Appeal Brief at page 17, section 7.4), appellants raise no further arguments. Accordingly, the examiner maintains the positions discussed above.

Regarding the fifth ground of rejection (see the Appeal Brief at page 17, section 7.5), appellants raise no further arguments. Accordingly, the examiner maintains the positions discussed above.

Regarding the sixth ground of rejection (see the Appeal Brief at page 18, section 7.6), appellants raise no further arguments. Accordingly, the examiner maintains the positions discussed above.

Regarding the seventh ground of rejection (see the Appeal Brief at page 18, section 7.7), appellants apparently argue, without support, that the disclosure regarding the device of the Azar (US 6,890,390) teaching could not be bodily incorporated into device as per the teachings of the other applied references (see the Appeal Brief at page 18, second to last full paragraph). The position of the examiner is that the test for obviousness is not whether the features of a secondary reference may be bodily

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incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Regarding the eighth ground of rejection (see the Appeal Brief at page 19, section 7.8), appellants raise no further arguments. Accordingly, the examiner maintains the positions discussed above.

Regarding the ninth ground of rejection (see the Appeal Brief at page 19, section 7.9), appellants apparently argue, without support, that the disclosure regarding the device of the Kim (US 2004/0132318) teaching could not be bodily incorporated into device as per the teachings of the other applied references (see the Appeal Brief at page 19, last full paragraph). The position of the examiner is that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

(11) Related Proceeding(s) Appendix

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No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/E. G./

Examiner, Art Unit 1714

Conferees:

/Michael Kornakov/

Supervisory Patent Examiner, Art Unit 1714

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